

Claims

- [c1] What is claimed is:
- 1.A method for improving the reliability of shallow trench isolation(STI), the method comprising:
- providing a substrate having a top surface;
- forming a trench-patterned mask layer on the top surface exposing an unmasked trench region of the substrate, the mask layer comprising a pad oxide layer, and a silicon nitride layer formed on the pad oxide layer;
- etching the unmasked region of the substrate to form a trench in the substrate;
- simultaneously oxidizing the silicon nitride layer and the substrate of the trench to form an in-situ steam growth (ISSG) film;
- depositing a dielectric layer to fill the trench and cover the mask layer;
- planarizing the dielectric layer to expose the silicon nitride layer; and
- stripping the silicon nitride;
- wherein the ISSG film reinforces an interface between the dielectric layer and the substrate to prevent acid penetration and acid-corroded seams being formed during the acid solution dipping process.
- [c2] 2.The method of claim 1 wherein the ISSG film is formed by an in-situ steam growth (ISSG) method.
- [c3] 3.The method of claim 1 wherein the ISSG film has a thickness between 50 and 250 angstroms.
- [c4] 4.The method of claim 1 wherein the dielectric layer is an HDP (high density plasma, HDP) oxide layer.
- [c5] 5.The method of claim 1 wherein before stripping the silicon nitride layer, the method further comprises performing a silicon oxide etching process to remove residual silicon oxide on the silicon nitride layer and simultaneously etch the dielectric layer of the trench.
- [c6] 6.The method of claim 1 wherein the acid solution dipping process uses DHF (diluted HF) solution.
- [c7] 7.The method of claim 1 wherein the silicon nitride layer is stripped by a 160 ° C

phosphoric acid solution.

- [c8] 8.The method of claim 1 wherein the substrate is a silicon substrate.